



Marshall Star, February 27, 2013 Edition

# MARSHALL STAR

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## Administrator Bolden Tours Marshall Center Advanced Manufacturing Facility, Highlights Space Program's Contributions to Revitalize U.S. Industry

By Kenneth Kesner and Jessica Eagan

NASA Administrator Charles Bolden saw some of the advanced manufacturing techniques like "3-D printing" being used to create parts for the Space Launch System (SLS) rocket engines during a visit to NASA's Marshall Space Flight Center on Feb. 22.

*Image right: From left, NASA Administrator Charles Bolden is joined by Marshall Center Director Patrick Scheuermann; Frank Ledbetter, chief of nonmetallic materials and manufacturing division at Marshall; and Andy Hardin, NASA's Space Launch System subsystem manager for liquid engines, during Bolden's tour of the National Center for Advanced Manufacturing Rapid Prototyping Facility at Marshall on Feb. 22.*

*During the visit, Bolden saw firsthand how NASA is using a high-tech 3D printing process called selective laser melting to create intricate metal parts for America's next heavy-lift rocket. (MSFC/Emmett Given)*



Bolden toured the National Center for Advanced Manufacturing's Rapid Prototyping Facility in Building 4707, where selective laser melting is creating complex parts like gas generator ducts without the multiple welds required by traditional methods. The technology is expected to provide parts much more efficiently and affordably for the SLS -- America's next-generation launch vehicle, designed to carry science missions, cargo and astronauts on missions beyond Earth orbit.

"Our team's innovative work here at Marshall and the NASA National Center for Advanced Manufacturing is just one example of how NASA is helping to reinvigorate America's manufacturing sector," said Bolden. "As NASA pushes the boundaries of exploration, our use of innovative techniques will allow us to build parts for everything from satellites to spacecraft more quickly and more affordably.

"I always learn something every time I come here [Marshall]," said Bolden. "It's a great place to be and work. Anything that we do in spaceflight -- whether it's human spaceflight or otherwise -- Marshall's involved. People who live here should know that Marshall is an integral part of NASA. It's who we are, to be quite honest."

According to a study by the Washington-based Tauri Group, the agency contributed \$5 billion to the U.S. manufacturing industry in 2012. Specifically, the study found development of the SLS had cumulatively contributed about \$930 million to the chemical, machinery, transportation equipment, fabricated metal, and computer and electronic product manufacturing sectors.

*Kesner and Eagan, Analytical Services Inc. employees, support the Office of Strategic Analysis & Communications.*

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## **Marshall Center 3-D Printing Advanced Manufacturing Innovations Aim to Enable Future Missions**

*By Kenneth Kesner and Jessica Eagan*



NASA's Marshall Space Flight Center is using a new additive manufacturing process, more commonly known as 3-D printing, to create innovative, lower cost rocket engine components. This new selective laser melting equipment uses a high-energy laser and three-dimensional computer-aided design to melt metal powder and layer it into the component desired.

***Image left: During his Feb. 22 visit to the National Center for Advanced Manufacturing Rapid Prototyping Facility at NASA's Marshall Space Flight Center, NASA Administrator Charles Bolden, center, talks with Frank Ledbetter, right, chief of the nonmetallic materials and manufacturing division at Marshall, about the use of 3-D printing and prototyping technology to create parts for the Space Launch System. Also participating in the tour are, from back right, Marshall Center Director Patrick Scheuermann; Sheri Kittredge, deputy manager of the SLS Liquid Engines Office; Lee Roop, reporter for The Huntsville Times; Rob Black, senior applications engineer with Shape Fidelity Inc., of Huntsville; and John Vickers, manager of the National Center for Advanced Manufacturing. (NASA/MSFC/Emmett Given)***

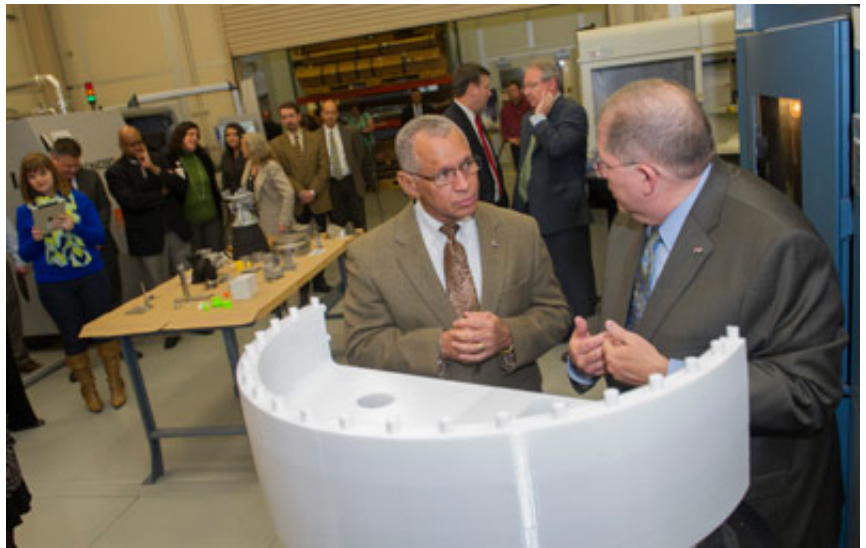
Some of these "printed" engine parts will be structurally tested for use in hot-fire tests of a J-2X engine as early as next

month. The J-2X will be used as the upper stage engine for the largest configuration of SLS. The goal is to use selective laser melting to manufacture parts for the first SLS test flight in 2017.

Selective laser melting will reduce the time and cost required to design, manufacture and test aerospace products by an order of magnitude while maintaining the highest quality, said John Vickers, manager of NASA's National Center for Advanced Manufacturing. At the same time, it dramatically increases the possibilities available to designers and engineers.

"NASA is investing in the future, in technology development and the use of 3-D printing methods, so new designs and systems can be digitally engineered and manufactured based on the 'imagination of the possible,' to deliver the ultimate solution for any application," Vickers said.

***Image right: NASA Administrator Charles Bolden, left, talks with Frank Ledbetter, chief of the nonmetallic materials and manufacturing division at Marshall, about a part of a prototype for the core stage-to-booster attach fitting during Bolden's Feb. 22 visit to the National Center for Advanced Manufacturing Rapid Prototyping Facility at Marshall. During his tour, Bolden watched researchers employ a 3-D printing process called "selective laser melting" to create complex parts for the J-2X and RS-25 rocket engines -- without welding. A video of selective laser melting in action is available at [http://www.nasa.gov/exploration/systems/sls/selective\\_melting.html](http://www.nasa.gov/exploration/systems/sls/selective_melting.html). (NASA/MSFC/Emmett Given)***



The potential benefits of additive manufacturing go far beyond the propulsion industry, he said. NASA is developing in-space, zero-gravity 3-D printing capabilities that could, for instance, give crews aboard the International Space Station a print-on-demand "machine shop" to fabricate parts and tools needed for repairs.

"Simply put, the ability to produce parts in space is a critical enabling technology for human exploration of the solar system," Vickers said.

NASA is using 3-D printing at six of its field centers to create a diverse portfolio of parts, from small satellites to rocket engines. Bolden said The Tauri Group study shows that agency technology investments like these are spurring America's manufacturing base.





"Last year, NASA invested a combined \$17 million in advanced manufacturing in five NASA programs analyzed by a just-released study – SLS, commercial crew, the James Webb Telescope, the International Space Station and the Space Technology Program," Bolden said. "These investments in innovation are enabling future space missions, bettering life on Earth and benefiting America's economy."

**Image left: From left, NASA Administrator Charles Bolden listens to Marshall materials engineer Nancy Tolliver; John Vickers, manager of the National Center for Advanced Manufacturing; and Rob Black, senior applications engineer with Shape**

**Fidelity Inc., of Huntsville, as they brief him on the use of 3-D printing and prototyping technology to create parts for the Space Launch System. (NASA/MSFC/Emmett Given)**

For more information and a video on the Marshall Space Flight Center's use of selective laser melting, visit [http://www.nasa.gov/exploration/systems/sls/selective\\_melting.html](http://www.nasa.gov/exploration/systems/sls/selective_melting.html).

For more information on NASA's Space Launch System, visit <http://www.nasa.gov/exploration/systems/sls>.

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## U.S. Reps. Mo Brooks and Steven Palazzo Tour Marshall Center

NASA's Marshall Space Flight Center Director Patrick Scheuermann, left, presents U.S. Rep. Mo Brooks of Alabama's 5th Congressional District, center, with a photo collage from the F-1 Gas Generator test firing which he attended Jan. 24. Brooks and U.S. Rep. Steven Palazzo of Mississippi's 4th District, right, toured the center Feb. 21. Palazzo serves on the [U.S. House Committee on Science, Space and Technology](#) and is the chairman of the [Subcommittee on Space and Aeronautics](#), and Brooks is a member of that subcommittee. (NASA/MSFC/Emmett Given)





U.S. Rep. Mo Brooks of Alabama's 5th District, left, and U.S. Rep. Steven Palazzo of Mississippi's 4th District, center, listen as David Beaman, right, manager of the Space Launch System Spacecraft & Payload Integration Office at the Marshall Center, explains the process of friction stir welding during the congressmen's center tour Feb. 21. (NASA/MSFC/Emmett Given)

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## NASA Inspires the Next Generation with the Space Launch System at Tennessee Tech University

*By Bill Hubscher*

NASA representatives traveled to Cookeville, Tenn., Feb. 21-23 and broke attendance records at the local science center while inspiring the current and next generation of scientists and engineers during "Engineers Week" at Tennessee Tech University.

***Image right: Don Krupp, left, SLS Control Systems manager; Mallory Johnston, SLS Flight Systems engineer; and John Rector, SLS Stages Green Run test manager, during a live video teleconference with local middle schools at the Millard Oakley STEM Center at Tennessee Tech University in Cookeville. The three Tennessee Tech alumni were part of an outreach partnership between SLS and the STEM Center. (NASA/MSFC)***



Representatives from the Space Launch System Program, or SLS, managed at NASA's Marshall Space Flight Center, partnered with the Millard Oakley STEM Center at Tennessee Tech to reach out to students across the region by talking about the importance of a balanced education in science, technology, engineering and math and to educate them about the new launch vehicle.

NASA employees Don Krupp, Mallory Johnston and John Rector -- all of whom are Tennessee Tech alumni who work on the SLS Program -- conducted more than a dozen teleconferences with hundreds of middle and high school students from the area on Feb. 22, answering questions about their careers at NASA and with SLS. Mike Kynard, manager of the SLS Liquid Engines Office, joined in some of the teleconferences and also in a special panel discussion with Tennessee Tech students and faculty, introducing them to the SLS rocket and discussing how the Marshall Center supports NASA's space exploration goals.

"It was great to see the enthusiasm for NASA when we spoke to the students," said John Rector, SLS Stages Green Run Test manager. "It felt good to give back to the university and see all the great work they are doing with the future engineers at the STEM Center."

"I never thought in a million years I would work for NASA," added Mallory Johnston, Flight Systems Engineer for SLS. "Standing in front of these students, from elementary school to college, talking about what I love and have been able to do as a NASA engineer, it's my favorite part of the job."



During the week, SLS Program Manager Todd May visited one of the companies currently building parts of the J-2X engine, which will be a critical component of the evolved version of the SLS. May toured the facilities of the Flexial Corp. of Cookeville, and talked to the workforce about the progress being made on NASA's next rocket. He also was given the chance to mingle with Tennessee Tech's engineering majors at their special awards banquet Feb. 21.

***Image left: College students at Tennessee Tech University in Cookeville learn more about NASA's Space Launch System at the debut of the new traveling SLS exhibit at the Millard Oakley STEM Center. The exhibit***

***was unveiled as part of the university's "Engineers Week" activities, which included panel discussions, career fairs, and hands-on activities for college and middle school students. (NASA/MSFC)***

The Marshall Center's Office of Public & Employee Communications supported a preview of the week's activities Feb. 19, with a tweet chat. Tennessee Tech students submitted questions via the "NASA\_SLS" Twitter account that were answered by some of the school's alumni who work at the Marshall Center.

The week culminated in a record-setting "FAB Friday" event Feb. 22 the STEM Center. At an event that normally draws 100 people, more than 300 registered parents and children viewed the new interactive SLS exhibit, participated in numerous hands-on scientific experiments and activities, and participated in a question-and-answer session with Kimberly Robinson, SLS Strategic Communications manager.

Johnston also mentored a group of 5th and 6th grade girls for an event Feb. 22 called "Engineering a Future." It is much like the FAB Friday event, but exclusive to young girls showing an interest in the STEM disciplines.

"We couldn't be more pleased to partner with NASA on debuting the new Space Launch System exhibit," said Gail Gentry, outreach coordinator at the Oakley STEM Center. "The FAB Friday program featured hands-on, SLS-based learning stations, including creating and launching your own rocket, learning how rocket engines work, using mock wind tunnels to test paper airplanes and more. It was a huge success for us and hopefully inspired a few more future engineers."

*Hubscher, an Analytical Services Inc. employee, supports the Office of Strategic Analysis & Communications.*

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## Understanding Marshall Space Flight Center -- In 30 Seconds Or Less

By Jena Rowe



Have you ever tried to put into concise words the type of work performed at NASA's Marshall Space Flight Center?

The spectrum of capabilities may seem too overwhelming to know where to begin.

The Marshall Center executive team has come together to simplify how we talk about the complex work at Marshall. This group has developed several one-liners to help team members effectively start a conversation about Marshall's expertise and capabilities in 30 seconds or less.

"Part of my job is to represent Marshall to internal and external audiences and tell our story," said Marshall Center Director Patrick Scheuermann. "But each of us at some point is an ambassador for Marshall, even if we're just talking to our families, friends, or the next-door neighbor. That adds up to literally thousands of chances to inform, influence and inspire our community. That's a powerful tool, especially if we start those conversations with the same basic points. Whether employees have a few seconds or a few minutes to tell the Marshall story, I hope everyone will find these notes useful."

The intent is to enable team members with stepping off points to easily and concisely communicate the story of Marshall. When using these points, it may help to ask yourself how the work you do relates to a particular point and contributes to the overall mission of Marshall. It has been demonstrated that one of the best ways to effectively communicate is to make it personal with your own experiences or observations.

So when someone asks, "What exactly does Marshall Space Flight Center do?" or "what do you do?", you might try one of these starting points to kick-off the conversation:

- Marshall has the unique expertise to ensure our nation can send humans beyond Earth and into deep space.
- Our core capability is in space transportation and propulsion systems with unique expertise in large-scale, complex space systems development.
- We advance space technologies, spark economic development, expand our knowledge, and inspire a new generation of explorers.

With these points as a guide, carrying on a conversation about the work taking place at Marshall can be done with ease. Every team member has a Marshall story to tell. How will you tell yours?

*Rowe, an Analytical Services Inc. employee and the Marshall Star editor, supports the Office of Strategic Analysis & Communications.*

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**Marshall Leaders Help Unveil 'Charger 1' Propulsion Research**

When the University of Alabama in Huntsville unveiled its new "Charger 1" fusion propulsion research facility Feb. 22 on Redstone Arsenal, government, academic and industry leaders on hand for the event included, from left, Dr. Robert Altenkirch, president of the University of Alabama in Huntsville; Dr. Dale Thomas, associate director of NASA's Marshall Space Flight Center; and Alabama Gov. Robert Bentley. The collaborative research initiative, which includes the university, the Marshall Center and The Boeing Company of Huntsville, will enable scientists to devise innovative experiments in advanced rocket propulsion, astrophysics and other related fields. (Aaron Sexton/UAHuntsville)



Marshall Center Associate Director Dr. Dale Thomas was among speakers Feb. 22 at the "Charger 1" event. Researchers say the new research facility could lead to advanced propulsion systems that could dramatically reduce travel times to Mars, asteroids and other destinations -- a critical boost to NASA's key goal of promoting affordable new ways to advance scientific discovery across the solar system. (Aaron Sexton/UAHuntsville)

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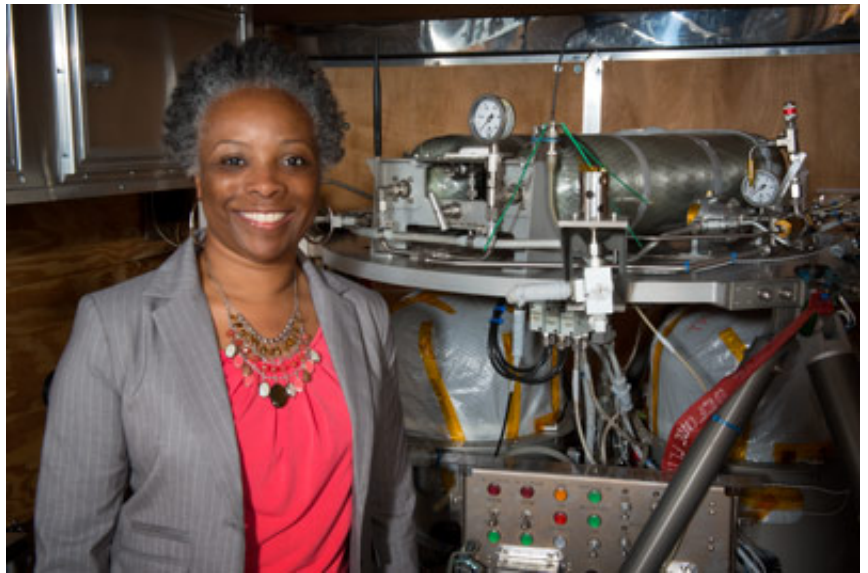
**The Face of Mission Success at Marshall is:**  
**Sorita Wherry**  
**Aerospace Engineer**

**Image right: Sorita Wherry (NASA/MSFC/Fred Deaton)**

- **Organization:** Engineering Directorate
- **Education:** Bachelor's degree in computer science, Alabama A&M University, 1991.
- **Years at Marshall:** 25 years
- **Responsibilities:** As a lead systems engineer for the "Mighty Eagle," also known as the Warm Gas Test Article, I'm



responsible for ensuring that the system technically fulfills the defined needs and requirements. The Mighty Eagle is a lander test vehicle that simulates a mission to the moon or other airless bodies through ground tests on Earth. I, along with the project engineer, oversee engineering activities performed by the technical team. The Mighty Eagle test vehicle demonstrates software and algorithms necessary to successfully perform Automated Rendezvous and Capture, or AR&C, maneuvers. We integrate technologies that include, but are not limited to, controls algorithms, sensor hardware, thruster configuration, avionics hardware, landing legs and aluminum decks.



- **How does your work at Marshall support the agency's goals?** There are several areas of my job that support our agency goals. The Robotic Lunar Lander Project will use the Mighty Eagle to mature the technology needed to develop a new generation of small, smart, versatile robotic landers capable of achieving scientific and exploration goals on the surface of the moon, asteroids or other airless bodies. Also, the Mighty Eagle will test and verify critical technologies to support small robotic lunar missions. It also will test and demonstrate the control methodologies required for the descent phase of a robotic lunar mission.
- **Have you found any unique, cost-saving or collaborative processes or innovations in the last year?** Yes, we are always looking for unique cost-saving innovations. We are currently in the process of building an optically similar lunar terrain field here at Marshall. Other hazard terrain fields exist within NASA, but none will have the optical contrasts necessary to test a hazard avoidance system that uses an optical camera. The trade between a Light Detection and Ranging, or LIDAR, versus an optical system will be an important trade if low-cost is to be achieved. The optical sensor technology being evaluated is less expensive, lighter and draws less power than a LIDAR. This hazard field is an important step in establishing the feasibility of these systems.
- **Safety remains Job One for NASA; how do you strive to live by that code?** It is my responsibility, along with the team, to oversee and ensure that everyone has the necessary training to safely operate the Mighty Eagle and its supporting equipment to achieve success before, during and after every flight. Before participating in tests, team members are properly trained to abide by the safety protocols in place to protect people and equipment. Before every flight we ensure that all areas listed in the test and checkout procedure plan are accomplished. This ensures safety and accuracy for conducting tests for the Mighty Eagle before and after flights.
- **What do you hope to accomplish in your role this year?** I hope to better understand and support the project as we continue to develop new and innovative ideas for each flight. We are developing a hazard avoidance capability for the Mighty Eagle terrestrial testbed lander. We also hope to accomplish and demonstrate hazard avoidance with the current Guidance, Navigation and Control, or GN&C, and AR&C flight demos that will provide a strong case for leading and partnering on a robotic mission.
- **What is the biggest challenge you face?** By nature I'm a perfectionist. However, this being a new area for me, I find myself having to rely on other teammates for their knowledge and experience so that together we are successful.
- **Do you partner outside your org/outside Marshall on your work? What, in your mind, exemplifies Marshall's value as a business partner?** Yes, we partner with other centers on continuous improvement of the Lander and its

functions, as well as working with other companies outside of Marshall. Currently, we are planning to collaborate with some outside companies beginning this spring. I believe one of Marshall's best attributes is its technical breadth and depth on subject matters. Marshall typically brings many years of discipline and experience when engaging a commercial partner on a task.

- **Who is someone you admire and why?** The person I admire is my mother. As a single parent, she provided me with the stability I needed as if I had both parents. She taught me that hard work, perseverance, respect and honor are assets of a leader. I give her all the praise for my success and accomplishments.

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## Shaping the Future One Student at a Time at Marshall

By Jena Rowe



Caroline Hernandez, a junior at Butler High School in Huntsville, spent Feb. 20 job-shadowing various NASA Marshall Space Flight Center team members -- including Center Director Patrick Scheuermann -- as a part of the WAAY-31 TV news series "We Are the Future."

**Image left: Butler High School student Caroline Hernandez, right, chats with Marshall Center Director Patrick Scheuermann, center, while being filmed by WAAY TV reporter Lillian Askins. (NASA/MSFC/Emmett Given)**

The station is partnering with Huntsville City and Madison County schools to highlight positive stories about future leaders among area high school students. The series focuses on 14 high school students as each explores different career opportunities.

Hernandez was nominated by her guidance counselor, Leigh Ann Brown, to job shadow at Marshall. "Caroline is an excellent student who excels in the areas of math and science. She is committed to her future goals and takes the initiative to achieve those goals," said Brown.

**Image right: Tawnya Laughinghouse, left, assistant branch chief of the Marshall Engineering Environmental Effects Branch, discusses her work with Butler High School junior Caroline Hernandez, right, while being filmed by WAAY TV reporter Lillian Askins. (NASA/MSFC/Emmett Given)**



Hernandez is a captain and the color guard commander in the Junior Reserve Officer Training Corps, or JROTC, at Butler. After graduation, she plans to attend Middle



"Caroline is a bright and talented student and we were thrilled to offer her a behind-the-scenes view of Marshall and technology and engineering career options," said Tawnya P. Laughinghouse, assistant branch chief of the Marshall Engineering Environmental Effects Branch. Laughinghouse, a materials engineer, passionate about mentoring young women interested in Science, Technology, Engineering and Math, or STEM careers, hosted Hernandez.

***Image left: Marshall's F-1 engine gas generator test team poses with Butler High School student Caroline Hernandez, center in hardhat, in front of a test stand during her visit to Marshall as part of the WAAY-31 TV news series "We Are the Future." With***

***Hernandez are, from left, Tawyna Laughinghouse, assistant branch chief of the Marshall Engineering Environmental Effects Branch; liquid propulsion systems engineers Erin Betts, Kate Estes, Nick Case and Graham Nelson; and test conductor Ryan Wall. (NASA/MSFC/Jennifer Stanfield)***

Hernandez's segment of "We Are the Future" aired Feb. 25 on WAAY during its 10 p.m. newscast and can be viewed online at: [http://www.waaytv.com/community/we\\_are\\_the\\_future/](http://www.waaytv.com/community/we_are_the_future/)

Rowe, an Analytical Services Inc. employee and the Marshall Star editor, supports the Office of Strategic Analysis & Communications.

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**Celebrating History through Storytelling and Songs**



*Dr. Tonea Stewart, an actress and director of theatre arts at Alabama State University in Montgomery, shares stories and songs with NASA Marshall Space Flight Center team members Feb. 26 at the Black History Month observance program. The Voices of Marshall chorus also performed at the event. (NASA/MSFC/Emmett Given)*



Stewart, front right, sings a song with the Voices of Marshall chorus at the Black History Month observance program. The chorus performed throughout the event. (NASA/MSFC/Emmett Given)

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## **Marshall Team Encouraged to Take High Risk Conflict Resolution Training to Learn About Workplace Violence**

A workplace violence prevention awareness class is now being offered at NASA's Marshall Space Flight Center.

The High Risk Conflict Resolution Training is a four-hour, hands-on seminar where attendees will learn what to do if faced with a critical incident of violence at work.

The class is designed for all Marshall team members, especially supervisors, managers and human resource specialists. Everyone is encouraged to attend.

"This is a great training opportunity in which all can benefit," said Diana Simpson, Marshall's workplace violence prevention program coordinator in the Protective Services Office. "Participants will examine previous workplace violence incidents,

learn the behavior of offenders, and practice verbal and physical tactics to survive a critical incident of violence in the workplace.

"Everyone wants to be safe in their work environment," she added. "The key to preventing a violent situation from occurring is 'Awareness+Action = Prevention.' This seminar will increase the participants' knowledge on what actions to take before and/or during a dangerous event."

Morning or afternoon sessions will be in Building 4627 on March 12, 8 a.m.-noon; March 13, noon-4 p.m.; March 14, noon-4 p.m.; and March 15, 8 a.m.-noon.

The training also includes voluntary physical skill drills and practical exercises to overcome conflicts in the office environment. Participants should wear clothing and footwear suitable for physical activity if ones plans to take part in the physical activities.

Team members can sign up for the training through [SATERN](#). For questions, contact Shawn Jayne, captain training coordinator, at 544-1961 or at [shawn.d.jayne@nasa.gov](mailto:shawn.d.jayne@nasa.gov).

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